Vertical Alignment of Scientific and Engineering Practice: Evaluating Designs

TEKS in Focus highlights key concepts and student expectations to assist educators in implementing the Texas Essential Knowledge and Skills (TEKS) in science. The vertical progression of a concept within the science TEKS is presented, along with detailed explanations from the TEKS Guide. The scientific and engineering practices are the first strand of the science TEKS. To create a cohesive learning experience, educators should integrate scientific and engineering practices with content. Embedding these practices in the content provides students with the context to ask questions, develop models, and analyze data. This approach ensures that students develop critical thinking and problem-solving skills by applying scientific and engineering practices to real-world scenarios as they learn the content.

Detailed explanations are provided for the underlined terms and phrases in each student expectation. Detailed explanations call out a specific word or phrase in a student expectation to clarify what students should know and be able to do in reference to that word or phrase. Detailed explanations may include an instructional boundary that specifies Tier 1 (baseline) instructional expectations for all students.

Scientific and Engineering Practice 2D

Science TEKS	Term or Phrase	Detailed Explanations from TEKS Guide
K.2.D, 1.2.D, 2.2.D, 3.2.D, 4.2.D ***<u>evaluate a design or object using criteria</u>*** *to determine if it works as intended*.	**evaluate a design or object using criteria**	Students understand how to evaluate an engineering design solution — a plan, process, or object (prototype) — to determine whether it functions as intended and meets the teacher-specified requirements.
5.2.D, 6.2.D, 7.2.D, 8.2.D, BIO.2.D, CHEM.2.D, IPC.2.D, PHYS.2.D ***evaluate experimental and engineering designs***.	**evaluate experimental and engineering designs**	Students should evaluate experimental designs to identify the variables being tested and determine whether appropriate controls were used and sufficient data were taken. Students should understand how to evaluate an engineering design solution to determine if it functions as intended and meets the specified requirements.

<u>TEKS Guide Glossary Terms (found in one or more student expectations of this vertical alignment):</u>
Glossary terms and definitions in the TEKS Guide are consistent from kindergarten through high school. The definitions provide educators with a common understanding of the terms, regardless of the grade level they teach. Glossary definitions are not intended for use with students.

data: factual information (such as observations, measurements, or statistics) used as a basis for reasoning, discussion, or calculation; often includes both useful and irrelevant or redundant information and must be processed to be meaningful

<u>TEKS Guide Further Explanation:</u>
The further explanation section is intended to serve as a resource to help educators better understand the topic their students are studying. Further explanations may be written at a level more complex than what is expected for students at that grade level.

The following further explanation appears in kindergarten through grade 12:

Students can evaluate their design solution (prototype, product, process, or proof of concept) using a rubric. A rubric is a tool that can be used to guide and assess student performance and skills related to the design challenge and associated thinking processes (engineering design process or computational thinking).
The rubric can be designed by students or the teacher and should consider the following areas:
Were the criteria and constraints for the design challenge met?

- Students design their solution based on the criteria (desired outcomes) and consider constraints (limitations).
  Did the design include ideas from all team members?
- Students work in collaborative teams to contribute solution ideas and design a cohesive plan.
  Did the design solve the problem?
- Students develop and implement testing processes, gather data, and engage in data analysis. Data results are analyzed to determine how the design solves the problem.
  Was the project at or under budget?
- Students conduct a cost-benefit analysis. A cost-benefit analysis compares the projected or estimated costs with the benefits (or opportunities) associated with project decisions. In an engineering design challenge, examples may include but are not limited to material costs, building/implementation time investment or duration, environmental impact, safety considerations, and projected durability or longevity of the design solution or product.